<Name of Project Here>

Analysis of Alternatives (AoA)

Study Plan

Office of Aerospace Studies

1 June 1998

Distribution Statement

Refer to these sources for more information:

1. Department of Defense Directive (DoDD) 5230.24, “Distribution Statements on Technical Documents”
2. Air Force Pamphlet (AFP) 80-30, “Marking Documents with Export-Control and Distribution-Limitation Statements” (to be reissued as Air Force Instruction (AFI) 61-204)

Ask your Scientific & Technical Information (STINFO) Officer for help in choosing which of the available statements best fits your AoA

REMEMBER -- AoA information may be PROPRIETARY, SOURCE SELECTION SENSITIVE, OR CLASSIFIED

Table of Contents

1. Introduction

1.1. Background
- Describe the history of developments that provide the necessity for the AoA
- Summarize relevant analyses that precede this study
- Paraphrase, quote, and refer to Mission Need Statement (MNS), Acquisition Decision Memorandum (ADM), and Program Management Directive (PMD) that required the AoA
- Identify intended results in general terms
- Identify any applicable Advanced Concept Technology Demonstrations (ACTDs)

1.2. Purpose
- Identify major acquisition issues to be studied
- Identify the Milestone to be supported

1.3. Scope
- Identify the level (engineering, one-on-one, few-on-few, mission, or campaign) and scope of the analysis planned
- Identify the “tailoring” and “streamlining” used to focus the study
- Describe broadly the nature of possible alternative solutions to be considered

2. Acquisition Issues

2.1. Mission Need
- Describe deficiency in system capabilities and refer to MNS or Operational Requirement Document (ORD) (if ORD exists)
- Identify the timeframe for the mission need
- Describe any applicable ACTDs

2.2. Scenarios
- Describe scenarios and rationale for selection
- Discuss how alternatives are evaluated and compared using scenarios
- Discuss how scenarios are traceable back to DPG/IPS (Defense Planning Guidance/ Integrated Program Summary)

2.3. Threats
- Describe briefly enemy tactics (include potential countermeasures)
- Paraphrase, quote, and reference the System Threat Assessment Report (STAR) or System Threat Assessment (STA), if it exists
- Identify other sources of projections

- Plan to approve or validate the threat through the Defense Intelligence Agency (DIA)
- Identify areas of uncertainty, if possible

2.4. Environment
- Describe expected operating environment, including terrain, weather, location, and altitude
- Paraphrase, quote, and reference applicable sections in the ORD (if it exists)
- Consider the environmental impacts of alternative solutions with the environment

2.5. Constraints & Assumptions for the AoA
- Describe AoA constraints and assumptions, including Initial Operating Capability, Full Operating Capability, and Life Cycle Cost
- Describe the implications of the constraints and assumptions
- Reference applicable sections in the MNS and ORD
- Identify the AoA resources available (people, funds and time) and how they affect the scope of the AoA

2.6. Operations Concepts
- Identify organizational functions and operations performed during mission
- Reference applicable section in ORD (if it exists)
- Describe how maintenance will be accomplished
- Discuss specific tactics and doctrine used
- Discuss deployment issues
- Discuss interfaces with other systems
- Address needs for inter-operation of the services
- Identify “day-to-day” and “contingency” operation implications
- Consider any recent field or test experiences that might be relevant
- Describe how the Concepts of Operations (CONOPS) fit each alternative

3. Alternatives

3.1. Description of Alternatives
- Identify the baseline case (this is usually the system in use today)
- Categorize alternatives based on technology, delivery platform, kill mechanism, etc., if productive
- Summarize each alternative
- Use figures to show system functions or interfaces
- Discuss operational concepts variations for individual alternatives
- Describe how alternatives perform their function
- Describe the steps taken to ensure an adequate range of alternatives
- Consider whether the alternative systems are reasonable and feasible

- Discuss the availability of the alternatives within the assumed timeframe
- Describe the economic operating life of each alternative, both expected and required

3.2. Nonviable Alternatives
- Delineate major alternatives that were not included in this analysis
- Describe the rationale for non-selection

4. Determination of Effectiveness Measures

4.1. Mission Tasks (MTs)
- Identify what task or tasks need to be achieved to satisfy the MNS
- Endeavor to keep MTs independent of one another
- Try to avoid MTs that use words such as “minimize,” “maximize,” and “optimize”

4.2. Measures of Effectiveness (MOEs)
- Derive MOEs from MTs
- Make military worth a prime consideration in the selection of MOEs
- Strive to form MOEs that measure and compare the most meaningful quantities that affect performance of MTs
- Support each MT with at least one MOE
- Consider that an MOE may support more than one MT, and may even support other MOEs
- Form ‘unbiased’ MOEs that are comparable across all alternatives
- Give preference to quantitative versus qualitative MOEs

4.3. Measures of Performance (MOPs)
- Derive MOPs from MOEs
- Support each MOE with at least one MOP
- Consider that an MOP may support more than one MOE, and may even support other MOPs
- Make sure MOPs are “knowable” either analytically or through testing
- Define MOPs by system performance characteristics, if possible

5. Effectiveness Analysis

5.1. Methodology
- Outline the approach and scope of the analysis, including the proper level of modeling military operations (e.g. campaign, mission, engineering, etc.)
- Plan to carry the baseline alternative through the final effectiveness analysis

- Plan to use MT and, as appropriate, MOE values in the cost-effectiveness analysis
- Consider the influence of threshold performance criteria, if any, in the methodology
- Describe the methodology, including models and simulations to be used
- Assign organizational responsibility for each step
- Describe the mechanisms to be used to obtain the buy-in to the methodology by the appropriate communities
- Plan to perform sensitivity tradeoff analysis, as appropriate
- Discuss how measures used in the AoA are testable and will support the development of the ORD and the Test and Evaluation Master Plan (TEMP)
- Add details as the plan matures

5.2. Models, Simulations, and Data

- Describe briefly the models used, their reason for selection, the input data to be used, and the corresponding sources of the input data
- Give evidence that data for the scenarios, threats, and each of the alternatives will be current, accurate, and unbiased (technically sound and doctrinally correct)
- Discuss any potential model biases, such as “man-in-the-loop” biases
- Describe the Verification, Validation and Accreditation (VV&A) processes to be used for the models
- Describe how models interface and how they are used to calculate MOEs and MOPs (use figures for clarity)

5.3. Effectiveness Sensitivity Analysis

- Identify potential Key Performance Parameters (KPPs) based on military utility

5.4. Results and Conclusions

- Expect Rough Order Magnitude (ROM) results in early phases; refine as possible
- Explore details at differing levels of analysis
- Use sensitivity analysis, if possible
- Present supporting analyses as they pertain to the AoA
- Include notional graphics for presenting results
- Rank-order alternatives based on reasonable criteria
- Add results to these sections as the data becomes available

6. Cost Analysis

6.1. Methodology

- Outline the approach and scope of the analysis

- Plan to carry the baseline alternative through the final cost analysis
- Consider the influence of threshold performance criteria, if any, in the methodology
- Use the same operational concepts for cost and effectiveness analyses
- Describe the methodology, including the models used
- Assign organizational responsibility for each step
- Describe the mechanisms to be used to obtain the buy-in to the methodology by the appropriate communities
- Plan to perform risk and sensitivity tradeoff analysis, as appropriate
- Add details as the plan matures

6.2. Models and Data

- Describe briefly the models used, their reason for selection, the input data to be used, and the corresponding sources of the input data
- Discuss any potential model shortfalls
- Request sufficiency review from SAF/FMC, in lieu of extensive VV&A for cost models

6.3. Life Cycle Cost (LCC) Analysis

- Consider the possibility of doing equal cost and equal effectiveness analyses
- Identify the baseline year used for costing
- Evaluate using base year (or constant) dollars (Evaluate then-year dollars if production schedules exist)
- Identify the economic operating life of the alternatives (i.e. 10 yr., 20 yr., 25 yr. sustained Operations and Support cost)
- Discuss the methodology for costing Research, Development, Testing, and Evaluation (RDT&E), Investment, Operations and Support (O&S), Disposal, and Total LCC for each alternative
- Identify "sunk costs" for information purposes only
- Discuss the application of Cost as an Independent Variable (CAIV) to LCC

6.3.1. Research and Development (R&D) Cost

- Describe RDT&E costing methodology (include MILCON costs)

6.3.2. Investment Cost

- Describe investment costing methodology (include MILCON costs)

6.3.3. Operations and Support (O&S) Cost

- Describe O&S costing methodology, considering personnel, operations, maintenance, recurring procurement, and spares

6.3.4. Disposal Cost

- Describe disposal costing methodology, considering redistribution, hazardous waste, and environmental cleanup

6.3.5. Total LCC

- Plan to show comparative LCC for each alternative, both by element cost and by total cost

6.3.6. Cost Sensitivity Analysis

- Plan to identify cost drivers (usually not the most expensive items – see handbook)
- Describe the methodology for determining the level of uncertainty for each element of LCC, as applicable

6.4. Results and Conclusions

- Plan to display graphic representations of cost in relationship to the baseline case
- Provide reminder and caution: An AoA is not a budget document

7. Cost-Effectiveness Analysis

7.1. Methodology

- Outline the approach and scope of the analysis, including the proper level of modeling military operations (e.g. campaign, mission, engineering, etc.)
- Consider cost and effectiveness as equal players in the analysis
- Plan to carry the baseline alternative through the final cost-effectiveness analysis
- Compare all alternatives on the basis of equal cost or equal effectiveness, if possible
- Plan to combine the cost and effectiveness analyses
- Describe the cost-effectiveness rank ordering methodology
- Describe the methodology, including the models used
- Assign which organization is responsible for each step
- Describe the mechanisms to be used to obtain the buy-in to the methodology by the appropriate communities
- Plan to perform sensitivity tradeoff analysis, as appropriate
- Plan to use figures and graphics for clarity

7.2. Models and Data Used

- Optional

7.3. Cost-Effectiveness Summary

7.3.1. Ranking and Decision Criteria

- Discuss criteria for selecting among alternatives
- Describe possible cost and performance thresholds

7.3.2. Tradeoff Analysis

- Array MOEs and cost to show how marginal changes in one affect the other
- Plan to show sensitivity of results to uncertainties in threat, baseline parameters, quantities purchased, or decision criteria
- Plan to identify possible cost and performance thresholds for each alternative

7.4. Results and Conclusions

- Rank-order alternatives based on reasonable criteria
- Display graphical representations of cost vs. Effectiveness

8. Organizational Responsibilities

- Identify who is doing what
- Include a phone number list for all organization points-of-contact

8.1. Study Team/Organization
8.2. Study Advisory Group (SAG) (if used)
8.3. Technical Oversight Advisory Group
8.4. Working Level Integrated Product Team
8.5. Overarching Integrated Process Team
8.6. Milestone Decision Authority

9. Study Report Outline

The Study Plan can be easily converted to a Study Report with the addition of the executive summary, the conclusions, and a little reorganization.

i. Cover
ii. Table of Contents
iii. Executive Summary – a summation (1-5 pages) of the report which should address:

1. Purpose -- why the AoA was accomplished
2. Background -- history and mission of current system
3. Deficiencies -- changes to mission needs or requirements
4. Alternatives -- describe ways the mission can be done
5. Evaluation -- identify analysis performed
6. Summary of Results -- describe the results for each alternative for both cost and operational effectiveness
7. Conclusions -- present the conclusions derived from the analysis

1. Introduction
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2. Acquisition Issues

…
3. Alternatives
…
4. Rationale for Choosing Effectiveness Measures
…
5. Effectiveness Analysis
…
6. Cost Analysis
…
7. Cost-Effectiveness Analysis
…

***** Notice that Study Plan Section 8 (Organizational Responsibility) has been moved to Appendix E.

Add:

8. Summary of Results
   - Summarize major findings
   - Highlight factors influencing acceptability
   - Highlight factors influencing cost of alternatives
   - Sensitivity analysis on significant cost drivers
   - Restate insights provided by the analysis in the study

Distribution List – included between the main body and the appendices
   - Include CPIPT offices, OAS, AoA members, etc.
   - Study Plan (SP) Sections 8 & 10-13 are reorganized into the following appendixes:

Appendix A: Documentation for the Operational Effectiveness Analysis
Appendix B: Documentation for the Cost Analysis
Appendix C: Documentation for Other Supporting Analyses
Appendix D: Other Supporting Documentation
Appendix E: Responsible Team Members and Organizations (SP Section 8)
Appendix F: Acronyms (SP Section 12)
Appendix G: References (SP Section 13)

10. Schedule – Provide the schedule you want to follow for this study. Below are typical duration ranges (from easy to difficult AoAs):

			Planned Date	Actual Date
Study Plan Preparation	1-4	Months		
Oversight: Review of Study Plan	1-2	Months		
Analysis	3-5	Months		
Oversight: Mid-term Review of Results	1-2	Months		
Any Further Analysis	3-5	Months		
Evaluate Results	2-2	Months		
Study Report Preparation	1-2	Months		
Oversight: Review of Study Report	1-2	Months		

Total 13-24 Months

11. Review Process – Describe what coordination you plan for reviews and who will approve both the Study Plan and the Study Report.

12. Acronyms

ACTD - Advanced Concept Technology Demonstration
ADM - Acquisition Decision Memorandum
AFI - Air Force Instruction
AFP - Air Force Pamphlet
AoA - Analysis of Alternatives
APB - Acquisition Program Baseline
CAIV - Cost as an Independent Variable
CONOPS - Concepts of Operations
CPIPT – Cost Performance Integrated Product Team
DIA - Defense Intelligence Agency
DoDD - Department of Defense Directive
DPG/IPS - Defense Planning Guidance / Integrated Program Summary
DT/OT - Development Testing / Operational Testing
KPP - Key Performance Parameter
LCC - Life Cycle Cost
MAA - Mission Area Assessment
MAP - Mission Area Planning
MDA - Milestone Decision Authority
MILCON - Military Construction
MOE - Measure of Effectiveness
MOP - Measure of Performance
MNA - Mission Need Analysis
MNS - Mission Need Statement
MSA - Mission Solution Analysis
MT - Mission Task
OAS - Office of Aerospace Studies
OIPT - Overarching Integrated Product Team (IPT)
ORD - Operational Requirement Document
O&S - Operations and Support
PMD - Program Management Directive
R&D - Research and Development
RDT&E - Research, Development, Testing, and Evaluation
ROM - Rough Order of Magnitude
SAF/FMC - Secretary of the Air force / Deputy Assistant Secretary for Cost and Economics
SAG - Study Advisory Group

SP - Study Plan
STA - System Threat Assessment
STAR - System Threat Assessment Report
STINFO - Scientific & Technical Information
TEMP - Test and Evaluation Master Plan
VV&A - Verification, Validation, and Accreditation

13. References

1. MNS
2. ADM
3. PMD
4. ORD
5. Analysis 1…